In the Specification:

At page 4, lines 13 through 14, please delete the paragraph:

"FIGURE 2 is a graph of capacitance versus a fractional amount of water in a flow of fluid including oil and water;"

At page 4, lines 15 through 16, please enter the following changes:

"FIGURE 2~~FIGURE 3A~~ is a cross-sectional view of a measuring device according to an embodiment of the present invention;

At page 4, lines 17 through 18, please delete the paragraph:

"FIGURE 3B is a cross-sectional view of a measuring device according to another embodiment of the present invention;"

At page 4, lines 19 through 21, please enter the following changes:

"FIGURE 3~~FIGURE 4~~ is a block diagram of a system for collecting data yielded by a measuring device according to an embodiment of the present invention; and

FIGURE 4~~FIGURE 5~~ is a flowchart of a routine using an embodiment of the present invention."

At page 5, line 8 through page 6, line 5, please enter the following changes:

"FIGURE 2~~FIGURE 2A~~ is a cross-sectional diagram of a measuring device 200 according to an embodiment of the present invention. One presently preferred embodiment of the device includes a housing 202 including a section of flanged pipe. A first input end 204 is coupled with a source of a flow of fluid (not shown) and a second outlet end 206 is coupled with an outlet for the flow of fluid. Flanges 208 and 209 and the first input end 204 and the second outlet end 206, respectively, allow the housing 202 to be coupled with flanged pipes for easy installation into a typical oil pumping installation. The housing 202 can be made of steel,

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copper, iron, PVC (which can be opaque, translucent, or clear for viewing the flow of fluid), or another suitable material as desired for a particular application.

Positioned inside the housing 202 is a magnetic field source 210 which, in one presently preferred embodiment, is an electromagnet. The magnetic field source 210 in this embodiment is a toroidal magnet powered by an external power source (not shown) via conductors (not shown). Applying a current 214~~212~~ to the magnetic field source 210 results, according to the right-hand rule, in an induced magnetic field 212~~214~~ revolving counterclockwise around the direction of the current 214~~212~~ from a perspective of one toward whom the current is flowing as shown in FIGURE 2~~FIGURE 2A~~. The induced magnetic field 212~~214~~ in turn results in an induced current 220 in a conductive portion of a flow of fluid passing through the housing. As previously described, a saline water component in the flow of fluid conducts electricity. A magnitude of the induced current 220 is a function of the controllable magnetic field 214 induced by the magnetic field source 210 and the proportion of the flow of fluid that is conductive. Knowing one of the variables affecting the induced current 220, in this case the induced magnetic field 212~~214~~, the conductive proportion of the flow of fluid can thus be measured from the magnitude of the induced current 220.

To measure the magnitude of the induced current 220 in the embodiment of the device 200, an inductance coil 230 is disposed downstream in the flow of fluid from the magnetic field source 210. The induced current 220 carried by the flow conductive portion of the flow of fluid being passing through the inductance coil 230 results in a magnetic field 232 being induced in the inductance coil. The magnetic field 234~~232~~, according to the right-hand rule, results in a current 232~~234~~ being generated in the inductance coil 230 which can be measured via conductors (not shown) coupling the inductance coils and a suitable measuring device (not shown). Thus, monitoring the induced current 220, a proportion of water in the flow of fluid containing water and oil can be determined, thereby allowing a relative proportion of oil in the flow of fluid to be measured."

At page 6, line 30 through page 7, line 22, please delete the paragraphs:

"FIGURE 2B shows a measuring device 250 according to another embodiment of the present invention. Principles used in the measuring device 250 are the same as the principles used by the measuring device 200 (FIGURE 2A) in measuring the proportion of oil in the flow of fluid, but the implementation of the measuring device 250 is somewhat different. The measuring device 250 includes a housing 252 through which a flow of fluid being measured

passes between a first input end 254 and a second outlet end 256. The first input end 254 and the second outlet end 256 each support flanges 258 and 259, respectively, allowing the measuring device 250 to be fitted to flanged pipes in an oil pumping or other facility.

Disposed within the housing 252 is a fixed magnetic source 260, instead of an electromagnetic source (FIGURE 2A). The fixed magnetic source 260 produces a magnetic field 262 to which a flow of fluid passing the fixed magnetic source 260 is exposed. The magnetic field 262 induces an induced electric current 270. As in the previously described embodiment, a magnitude of the induced electric current 270 is proportional to a magnitude of the magnetic field 262 and a conductive proportion of the flow of fluid. Thus, knowing a magnitude of the magnetic field 262, the conductive proportion of the flow of fluid can be determined.

It will be appreciated that an inductance coil like the inductance coil 230 (FIGURE 2A) could be used to measure a magnitude of the induced electric current 270. Instead, to illustrate one possible alternative way of measuring the induced current 270, contact plates 280 and 290 are disposed in the housing 262. The induced current 270 caused by imposition of the magnetic field 262 can be measured between the two contact plates. The induced current 270 suitably is measured by a measuring device (not shown) coupled with conductors (not shown) for measuring the current flowing between the two contact plates 280 and 290. Additional sensors such as those described in connection with the measuring device 200 (FIGURE 2A) can be used to allow for measurements to be made of the total amount of fluid passing through the measuring device 250 and to adjust such measurements for pressure, density, temperature, or other factors."

At page 7, line 23, through page 8, line 21, please enter the following changes:

"FIGURE 3 is a block diagram of the measuring device 200 (FIGURE 2~~FIGURE 2A~~) and a system 300 for collecting data yielded by the measuring device 200 in one presently preferred embodiment. The measuring device 200 is coupled with a source of the flow of fluid 315 via a pipeline or other vessel 320. A gas separation device 310, which suitably is a gas liquid cylindrical cyclone separator or a comparable device, separates liquid from gas. The gas separation device 310 receives a composite flow 305 containing at least one of oil, water, and gas. The gas separation device 310 separates the gas from the liquid, resulting in a separated flow of gas 312 diverted from the flow of fluid 315. The flow of fluid 315 passes through the measuring device 200 to a pipeline 325 routing the flow of fluid to a destination (not shown). ~~It will be appreciated that the measuring device 250 (FIGURE 2B) could be used in the system 300 instead of the measuring device 200. Regardless of the embodiment of the measuring device 200~~

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~~or 250, further operation of the system 300 is the same.~~ Thus, when operation of the measuring device 200 is described, it will be appreciated that the measuring device 250 could be substituted in place of the measuring device 200.

The measuring device 200 is coupled via a communication device 340 to a computing module 350. The communication device 340 suitably includes a plurality of conductors directly joining the sensors directly to a computing module 350. In this exemplary embodiment, output of the sensors, including an inductance coil 230 (FIGURE 2~~FIGURE 2A~~), flow rate sensor 240, or other sensors is represented by analog signals. Alternatively, an analog-to-digital converter (not shown) may be included within the measuring device 200 itself, with an output of the analog-to-digital converter being coupled to the computing module 350. The digitized output of the sensors deployed in the measuring device 200 may be coupled to an interface, such as an RS-232 interface, which is coupleable to a complementary connector on the computing module 350.

The computing module 350 digitizes and processes the analog signals or processes the digital signals from the sensors 230, 240, 242, 244, and 246~~, 280, and 290~~ (FIGURE 2~~FIGURES 2A and 2B~~) as previously described. The computing module 350 receives the induced current signal from the inductance coil 230 ~~or the contact plates 280 and 290~~ or other current measuring device. The computer module 350 uses the digital or digitized signals to determine the proportion of oil in the flow of fluid. The proportion of oil in the flow of fluid can be combined with output of the flow rate sensor 240 (FIGURE 2~~FIGURE 2A~~) to calculate the total rate of flow of oil. The total rate of flow of oil can be adjusted for pressure, density, and temperature measurements taken of the flow of fluid as previously described."

At page 9, line 20, through page 10, line 4, please enter the following changes:

"FIGURE 4 is a flowchart of one presently preferred routine 400 using an embodiment of the present invention. The routine 400 begins at a block 402. At a block 404, gas is separated from the flow of fluid as previously described. At a block 406, using one presently preferred embodiment 200 (FIGURE 2~~FIGURE 2A~~) of the present invention, a signal is applied to a magnetic field source. ~~Alternately, the magnetic field is generated by the magnetic source 260 (FIGURE 2B).~~ At a block 408, an induced current caused by the imposition of the magnetic field is measured. At a block 410, the signal representing the induced current is digitized. At a block 412, a proportion of oil in the flow of fluid is calculated from the induced current measured. Such calculation could be made using a look-up table keyed to a range of applied signals or through a similar method.

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If desired, at a block 414 the flow rate of the entire flow of fluid is measured. At a block 416, the flow rate is combined with the proportion of oil in the flow of fluid to determine a total rate of oil flowing through the measuring device 200 (FIGURE 2~~FIGURE 2A~~). At a decision block 418 it is determined if other measurements such as pressure, temperature, or fluid density are to be measured and applied to adjust the total rate of oil flowing in the flow of fluid. If so, at a block 420 the other quantities are measured and the total rate of oil flowing is adjusted. If no such adjustment is desired or after an adjustment is made, at a block 424 the measurements are communicated to a data collection device. The routine 400 ends at a block 426. The routine 400 could be repeated continually, at intervals, on demand, or as otherwise desired."

In the Figures:

Please replace FIGURE 2A with FIGURE 2, which is identical to FIGURE 2A except for its title. Please delete FIGURE 3.

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In the Specification:

Please enter the following Preliminary Amendment. Applicants represent that the following changes to the specification and drawings represent five changes: (1) deletion of a figure describing an alternative embodiment of the present invention, FIGURE 2B; (2) removal of references to the deleted figure; (3) renumbering of "FIGURE 2A" to "FIGURE 2" to correspond with deletion of "FIGURE 2B"; (4) deletion of a brief description of a figure not included with the specification; and (5) revising of reference numerals to redress typographical errors in the specification so that the specification more clearly corresponds with the figures. Applicants attest that the deletions and changes requested add no new matter to the pending application.

Respectfully submitted,

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MAIL CERTIFICATE

I hereby certify that this communication is being deposited with the United States Postal Service via First Class Mail under 37 C.F.R. § 1.08 on the date indicated below addressed to: **MAIL STOP NON-FEE AMENDMENTS**, Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.

12/19/2003
Date of Deposit

C.J. Golborne
Christine J. Golborne

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